GENERAL DYNAMICS
C4 Systems

Integrating Land Warrior into the Army Battle Command System

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Introduction

- **The ability of a soldier to function as part of a larger system of systems promises to provide significant operational advantages.**
- **Weaving the individual soldier into the fabric of the digitized battlefield to extend network-centric operations to the lowest echelon is essential to this vision.**
- **The objective will be realized through efforts currently underway as part of the U.S. Army's Land Warrior program.**
- **Land Warrior integration into the ABCS will provide "Total Battlefield Visibility" through command, control, communications and information sharing at the soldier level.**

Land Warrior (LW) Soldier System Ensemble

Key Soldier Ensemble HW/SW Components

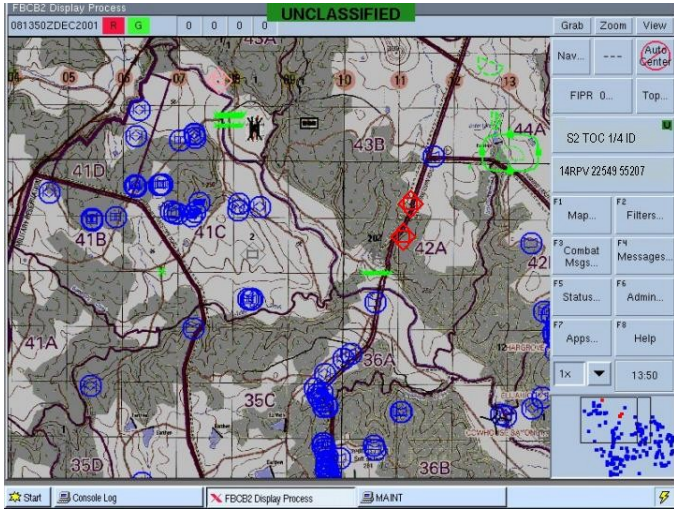
- **Computer –** LW and ABCS messaging software; voice processing; power management; map management
- **Soldier Control Unit (SCU)/Weapon User Interface (WUI) –** Central system controller (SCU); Limited system control (WUI) with both hands on weapon
- **Helmet –** Full color display for computer and weapon sensor interface; speaker microphone
- **Weapon –** Integrated weapon sensors (multifunction laser, daylight video sight, thermal weapon sight); weapon user interface device
- **Power –** Accommodates dual disposable or rechargeable batteries; accepts system power when tethered to Stryker
- **Navigation –** Integrated GPS and Dead Reckoning Device automated and managed through SCU and helmet display
- **Communications –** CommsNet Radio running EPLRS waveform provides simultaneous voice and data capability
- **PCIE –** Physically integrated ensemble including Interceptor Body Armor/Utility Belt, MOLLE Load Bearing and OTM Hydration

Army Battle Command System (ABCS)

- ABCS is a suite of cooperating host computer systems, also known as Battle Functional Areas, that provide planning, command and control (C2), intelligence and situational awareness (SA) capabilities.
- Many of these systems are installed in the division TOCs, where data communication is primarily via the Upper Tactical Internet (UTI).
- In the Stryker Brigade Combat Teams (SBCT), systems such as MCS-Light and ASAS-Light are installed in the Brigade (BDE) and Battalion (BN) command vehicles, facilitating Battle Command On-the-Move.
- At BDE and below, these SBCT platforms communicate via the Lower Tactical Internet (LTI) using the EPLRS radio system for data and SINCGARS ASIP combat net radio for voice
- Dissemination of Battle Command and Situational Awareness messages and interaction between the echelons is achieved via Force XXI Battle Command, Brigade and Below (FBCB2) systems installed in the mobile platforms

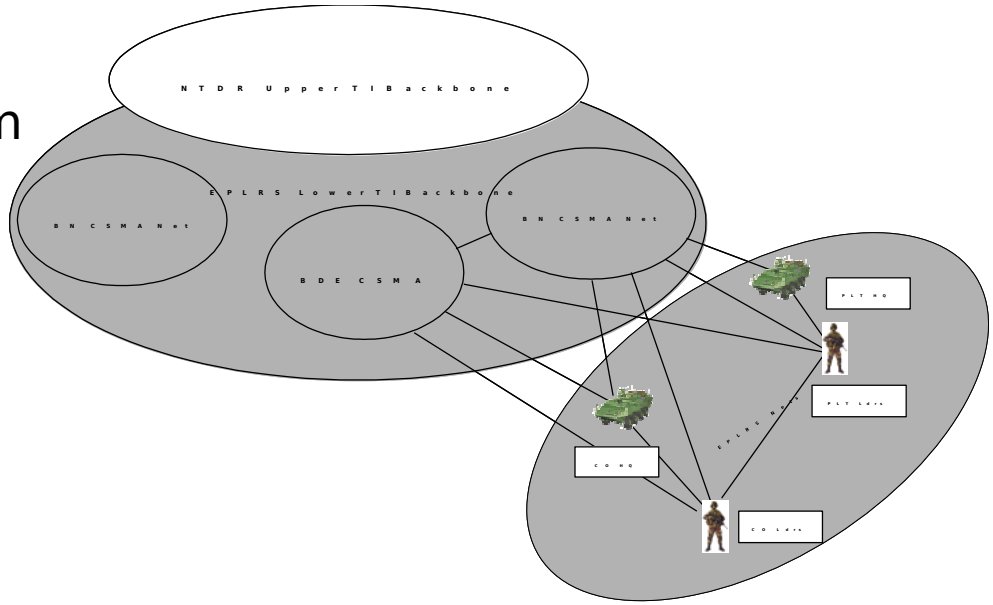
Force XXI Battle Command Brigade and [illegible]2)

- The principal Digital Command and Control System for the Army at Brigade and Below
- Consists of ruggedized COTS Applique hardware and software, & TI system architecture
- FBCB2 software provides Situational Awareness (SA) – Blue, Red & Georef on map or image - and C2 messaging – pre-defined and free text.
- Integrated into most platforms at Brigade and below, as well as appropriate Division and Corps slices necessary to support Brigade operations.
- Interconnects platforms through a comms infrastructure called the Tactical Internet, based on commercial IP and made up of existing EPLRS and SINCGARS radios and the INC router.
- Basis for Balkans Digitization Initiative (BDI) and Blue Force Tracking (BFT).
- NGMS prime contractor.



Structure of the U.S. Army Tactical Internet with SBCT

- The Tactical Internet (TI) is a TCP/IP based tactical communications network supporting exchange of digital information in the form of C2, SA messages.
- Primary elements of the Lower TI for SBCT are EPLRS and the Internet Controller (INC), which integrates the platforms into a functioning Internet.
- The TI operates in a secure mode, accredited to operate at a secret classification level.



Message Exchange in the TI

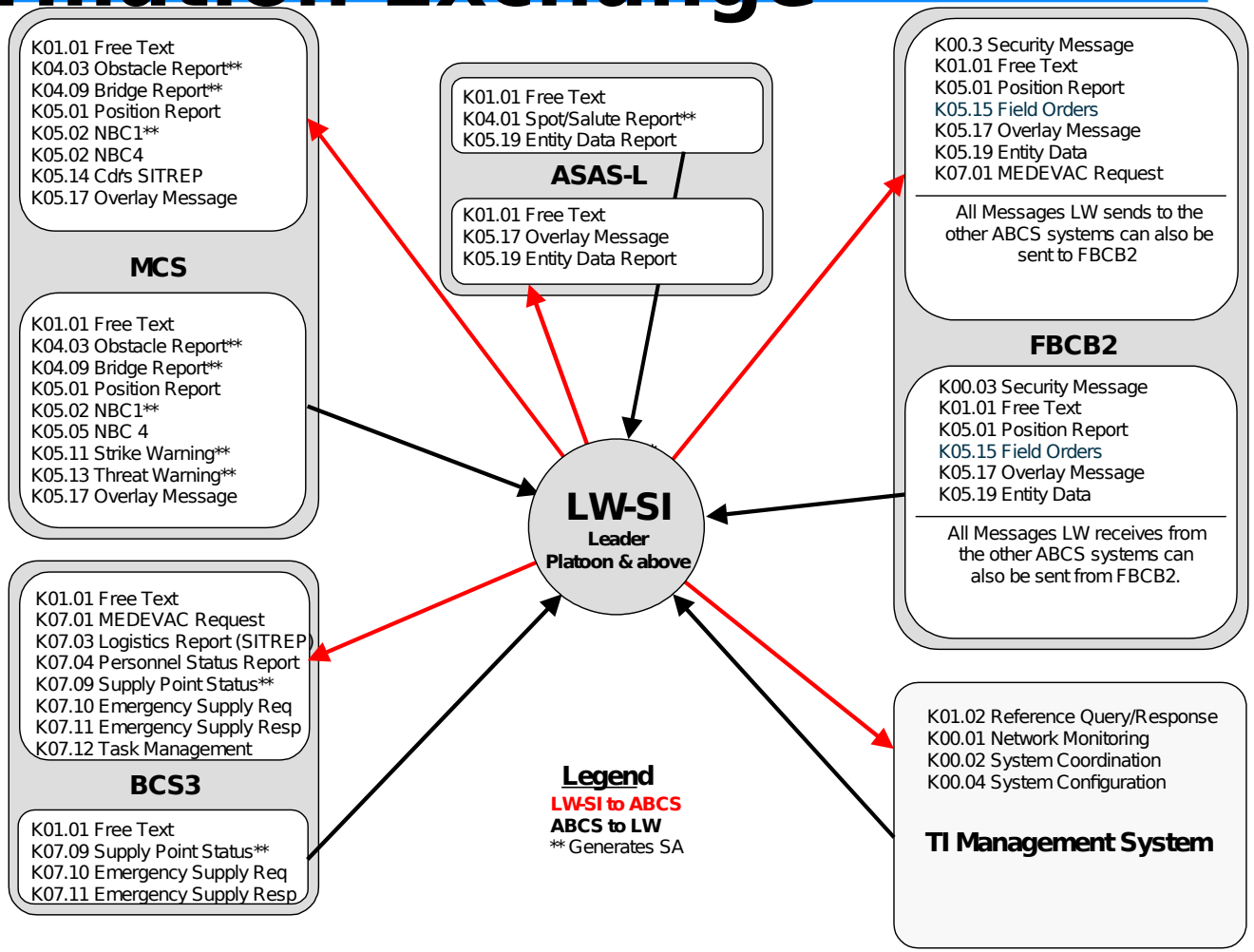
- **FBCB2 and other ABCS host systems use a bit-oriented messaging standard, known as the VMF, to provide most of their C2 and SA data capability**.
  - ABCS systems in the UTI are increasingly using XML messaging, particularly for large messages such as field orders.
- **The majority of VMF message traffic is transferred using multicast (UDP) dissemination to pre-defined groups**.
  - Large multicast messages utilize a Multicast Dissemination Protocol (MDP) to improve reliability of transfer.
- **Point-to-point messages use unicast (TCP/IP) protocols and a special feature of EPLRS known as Dynamically Allocated PVCs (DAPs) that are set up for the duration of the message transfer and torn down on completion.**

LW Integration into the ABCS

- LW leaders (platoon and above) will send and receive VMF messages to and from ABCS host systems on the LTI
  - specifically participating in the battalion C2, battalion SA, brigade SA needlines and possibly the brigade C2 needlines)
- Unit Task Organization (UTO) database must be updated and pre-loaded in order to participate on the LTI and exchange messages with ABCS
  - UTO defines the addressee roles (duty positions), IP unicast and multicast addresses and the group participation of each platform
  - Platforms registered with a multicast group receive all traffic transmitted by members of that group
- LW implements the minimum functionality necessary to support the routing protocols and coordination messages that keep LW leader systems synchronized with the lower TI, while mounted or dismounted
  - LTI capability embedded in all LW systems and can be software activated as needed in accordance with role

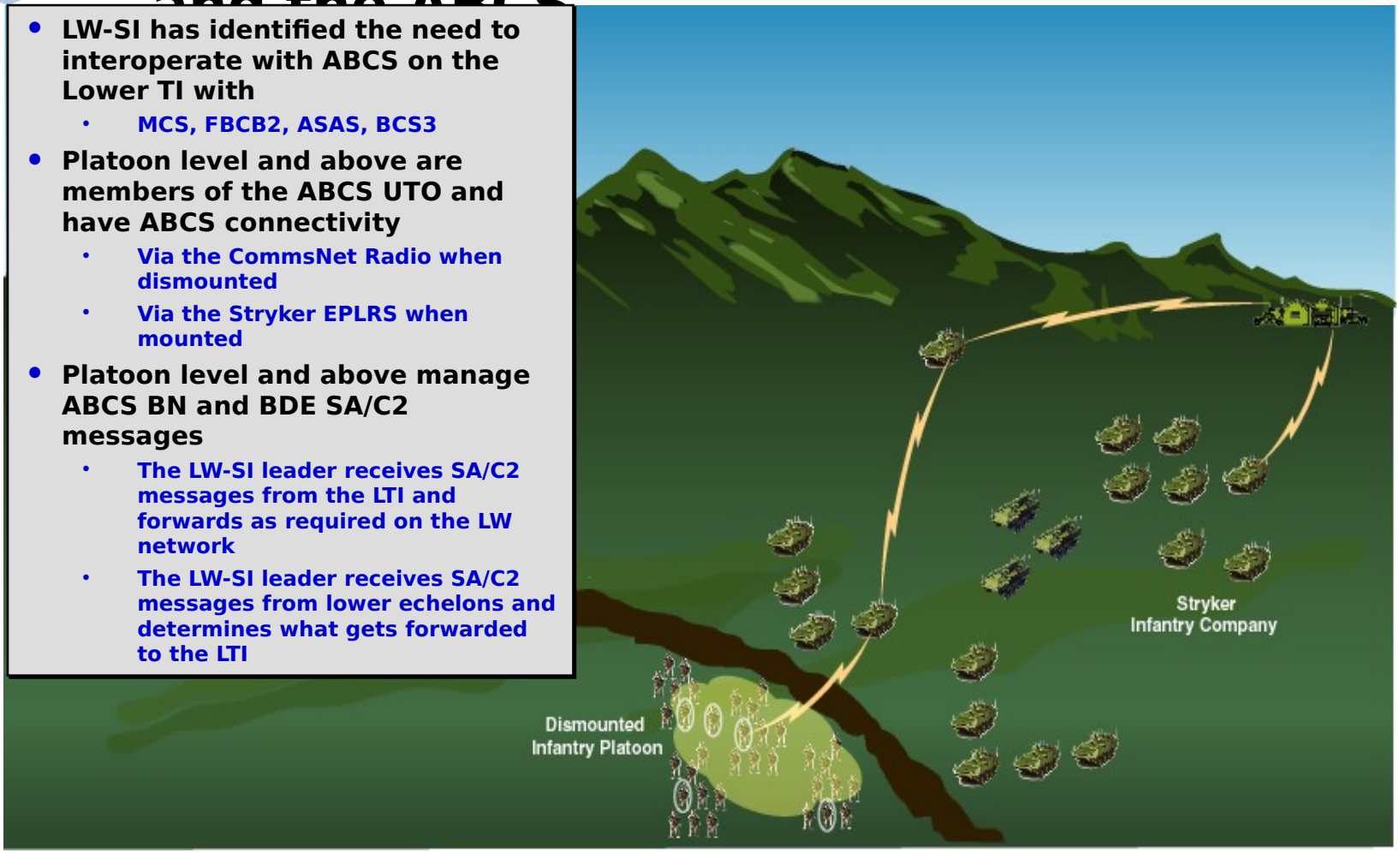
LW Leader ABCS Information Exchange

- LW will use VMF to provide its C2 and SA data capability, to ensure ABCS interoperability,
- The messages used by LW are a subset of the Joint VMF message catalog, and a subset of those used by FBCB2.
- Diagram provides an indication of which ABCS host systems will exchange data with LW leader systems.
- Message exchange agreements are necessary between these systems to assure interoperability and certification.



Dismounted SBCT Infantry Platoon connects with Strykers and the ABCS

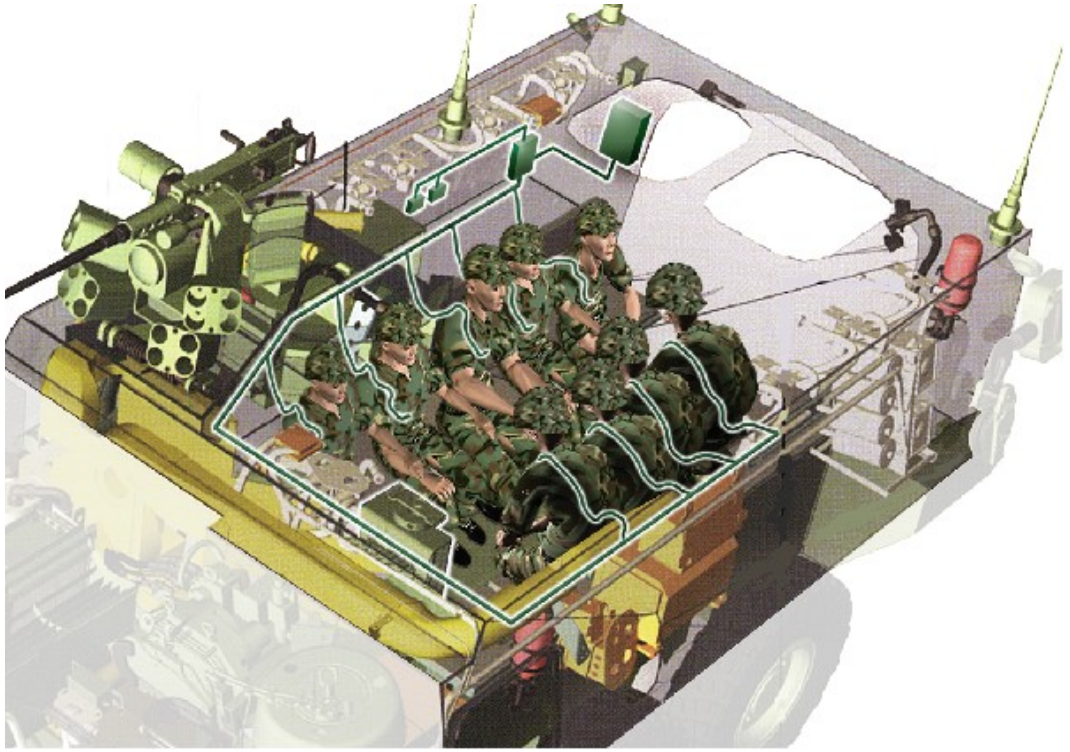
- LW-SI has identified the need to interoperate with ABCS on the Lower TI with
  - MCS, FBCB2, ASAS, BCS3
- Platoon level and above are members of the ABCS UTO and have ABCS connectivity
  - Via the CommsNet Radio when dismounted
  - Via the Stryker EPLRS when mounted
- Platoon level and above manage ABCS BN and BDE SA/C2 messages
  - The LW-SI leader receives SA/C2 messages from the LTI and forwards as required on the LW network
  - The LW-SI leader receives SA/C2 messages from lower echelons and determines what gets forwarded to the LTI



Stryker Vehicle Integration Kit (VIK)

Key VIK HW/SW Components

- **Gateway –** Voice and data connectivity between soldiers and Stryker crew and systems
  - VIC Crew intercom
  - FBCB2 Appliqué
  - EPLRS radio
  - INC
- **Switch –** Digitized voice and data routing between mounted and dismounted soldiers; soldier system power feed
- **Battery Charger –** Charges soldier system batteries
- **Control and Display Panel –** Provides VIK subsystem management

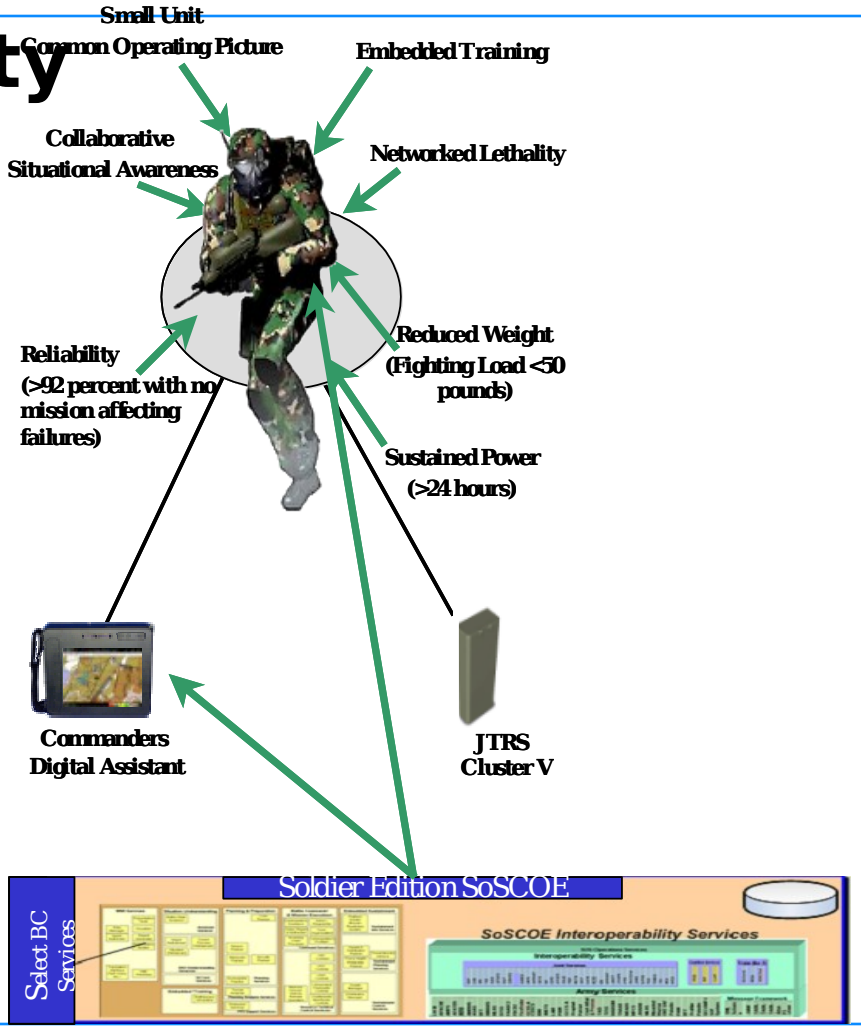


Soldier as a System – Ground Soldier System (GSS) Interoperability

- **Soldier as a System will be the centerpiece of the FCS-equipped Unit of Action (UA), and the U.S. Army's Family of Soldier Systems (FoSS)**
  - The GSS and FCS utilize distributed capabilities via advanced networked communications to reduce the burden on individual warfighter platforms
- **Initial versions of GSS may still be equipped with LW CNRS radio running the EPLRS waveform, however, the objective comms platform for GSS is the Joint Tactical Radio System (JTRS) Cluster 5 radio running the Soldier Radio Waveform (SRW).**
  - Assuming FCS vehicles are equipped with JTRS Cluster 1 radios with the EPLRS waveform loaded in their waveform libraries, the interoperability approach for fielded LW systems remains the same as the current ABCS interoperability approach.
- **Objective version of the GSS will take a more integrated approach to interoperability with the FCS platforms by utilizing soldier-specific deployments of FCS SoSCOE and Battle Command applications.**
  - This approach, coupled with the use of the Cluster 5 radio and the Soldier Radio Waveform, will enable direct communication and interoperability with all FCS assets while maintaining interoperability with legacy forces using the SoSCOE External Interoperability proxy service.

Soldier as a System – Ground Soldier System Interoperability

- GSS leverages the following to dominate and win the close fight
  - Netted comms
  - SA/UDOP
  - Soldier borne & deployed sensors
  - Robotics
  - Advanced weapon technology
  - Embedded live & virtual training
  - Enhanced protection
- Interoperability with FCS platforms is assured by utilizing the Cluster 5 radio and soldier-specific deployments of FCS SoSCOE and Battle Command applications
- Interoperability with legacy ABCS systems is assured by using Cluster 5 and SoSCOE External Interoperability proxy service.



Summary

- Integration of dismounted and mounted Land Warriors into the ABCS and the Stryker Brigade Combat Team will provide enhanced battle effectiveness which includes:
  - Improved Real-time situational awareness (including local display of soldiers associated with specific Stryker vehicles)
  - A shared common picture of the battlespace
  - A wider view of friendly and enemy unit locations
  - Ability of LW Leaders to communicate with higher echelons and host platforms
  - Seamless battle command capabilities for BDE leaders through to PLT echelon through the TI, and below through E-LTI
  - Improved integrated logistics support
- Net result of digital integration is a significant improvement in lethality, survivability, mobility, and sustainment.

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Thank You!

Acronyms

ABCS	Army Battle Command System
ASAS	All Source Analysis System
BCS3	Battle Command Sustainment Support System
BDE	Brigade
BFT	Blue Force Tracking (FBCB2)
BN	Battalion
C2	Command and Control
CNRS	Comms Net Radio System
CSMA	Carrier Sense Multiple Access
DAPS	Dynamically Allocated Permanent Virtual Circuits
E-LTI	Extension to LTI (Land Warrior voice & data)
EPLRS	Enhanced Position Location Reporting System
FBCB2	Force XXI Battle Command Brigade and Below
FCS	Future Combat System
FoSS	Family of Soldier Systems
GPS	Global Positioning System
INC	Internet Controller
IP	Internet Protocol
JTRS	Joint Tactical Radio System
JVMF	Joint Variable Message Format
LTI	Lower Tactical Internet
LW	Land Warrior
MCS	Maneuver Control System
MDP	Multicast Dissemination Protocol
MOLLE	Modular Lightweight Load Carrying Equipment
NTDR	Near Term Digital Radio
OTM	On-the-Move
PCIE	Personal Clothing & Individual Equipment
SA	Situational Awareness
SBCT	Stryker Brigade Combat Team
SCU	Soldier Control Unit
SoSCOE	System of Systems Common Operating Environment
SRW	Soldier Radio Waveform
TI	Tactical Internet
TOC	Tactical Operations Center
UA	Unit of Action (FCS)
UDOP	User Defined Operating Picture
UDP	User Datagram Protocol
UTI	Upper Tactical Internet
UTO	Unit Task Organization
VIC	Vehicle Intercom (Stryker)
VIK	Vehicle Integration Kit (Stryker)
VMF	Variable Message Format
WUI	Weapon User Interface
XML	Extensible Markup Language